

Remarks

This Preliminary Amendment removes multiple dependencies in the claims. Please calculate the Filing Fee according to this Preliminary Amendment.

Respectfully submitted,



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“Version with Markings to show Changes Made”

1. A system for protected data transmission in ring-shaped bus systems, comprising
 - a control unit (1) which sends output data and checking signals for a control process to peripheral units (4, 7, 8, 9, 12),
 - a peripheral monitoring unit (4) which has a first transfer unit (5) for monitoring the transmitted data and a second transfer unit (6) for monitoring data to be read back into the control unit (1), and
 - at least one peripheral safety-related unit (9) for receiving or transmitting safety-related data, in which data are temporarily stored for output, which has a checking logic (11) for monitoring the temporarily stored data and an output unit (10) for outputting the temporarily stored data,
the temporarily stored data being monitored by the checking logic (11) in such a manner that, in the case of a fault, a safe state of the output unit (10) for the control process is initiated,
 - the first transfer unit (5) monitoring the data sent out by the control unit (1), in such a manner that, in the case of a fault, release data for the peripheral safety-related unit (9) are suppressed or deleted so that the faulty data do not reach the control process, particularly data transmission sequences, wherein the input data of the peripheral safety-related unit (9) and its temporarily stored data are read back via the second transfer unit (6).
2. The system as claimed in claim 1, characterized in that the temporarily stored data and the input data of the peripheral safety-related unit (9) are provided to the peripheral monitoring unit (4).

3. (Amended) The system as claimed in claim 1 [or 2], characterized in that the peripheral safety-related unit (9) reads back the temporarily stored data via a bus unit (23).
4. (Amended) The system as claimed in claim[s] 1 [to 3], characterized in that the peripheral safety-related unit (9) has a buffer (27) which is read back by a bus unit (23) and is thus checked by the peripheral monitoring unit (4) even before release to the control process, particularly of data transmitted via the bus, via the output logic (28) with the output signal (29).
5. (Amended) The system as claimed in claim[s] 3 [or 4], characterized in that the peripheral safety-related unit (9) comprises a further bus unit (22) so that the peripheral safety-related unit (9) has redundant input channels (24, 25) and thus redundantly monitors the connected control process and can detect a fault.
6. (Amended) The system as claimed in claim[s] 1 [to 5], characterized in that the checking logic (11) decides whether the data stored in the buffer (27) are output via the output logic (28).
7. (Amended) The system as claimed in claim[s] 1 [to 6], characterized in that the checking logic (11) releases or deletes the temporarily stored data.
8. (Amended) The system as claimed in claim[s] 1 [to 7], characterized in that the peripheral monitoring unit (4) with the first transfer unit (5) is capable of manipulating the data for the peripheral safety-related unit (9).
9. (Amended) The system as claimed in claim[s] 1 [to 8], characterized in that the peripheral monitoring unit (4) overwrites data of the SPC.

10. (Amended) The system as claimed in claim 1 [to 9], characterized in that the agreement to a data output from the peripheral safety-related unit (9) is prevented by the overwriting of the data.

11. (Amended) The system as claimed in claim 1 [to 10], characterized in that the checking logic (11) receives from the peripheral monitoring unit (4) an information item which prevents a faulty output.

12. (Amended) The system as claimed in claim[s] 1 [to 11], characterized in that the peripheral safety-related unit (9) only becomes active if it has received an agreement for the data of the output unit (10) via the checking unit (11).

13. (Amended) The system as claimed in claim[s] 1 [to 12], characterized in that the peripheral units (4, 7, 8, 9, 12) themselves can perform logic operations and thus a higher process speed is achieved in the overall combined operation.

14. (Amended) The system as claimed in claim[s] 1 [to 13], characterized in that the peripheral monitoring unit (4) itself handles control functions and thus a combined operation with a safety control unit is produced.

15. (Amended) The system as claimed in claim[s] 1 [to 14], characterized in that the peripheral safety-related unit (9) manages with standard non-safety-related modules for the bus traffic and does not need any special safety-related modules.

16. (Amended) The system as claimed in claim[s] 1 [to 15], characterized in that the function is operable in standard bus systems and is capable of operating without additional installation of further bus systems or special components.

17. (Amended) The system as claimed in claim[s] 1 [to 16], characterized in that the function can be installed subsequently by adding the peripheral monitoring unit (4) and exchanging normal peripheral units for peripheral safety-related units (9).

18. (Amended) The system as claimed in claim[s] 1 [to 17], characterized in that the safety function of the system can also be subsequently expanded by adding hardware elements or software modules.

19. The system for protected data transmission, particularly in ring-shaped bus systems, in which a peripheral monitoring unit (4) checks the data sent out by a control unit (1) and examines them for faults and in the case of a fault suppresses or deletes release data for a peripheral safety-related unit (9) so that a fault cannot reach the control process, particularly not data transmission sequences.

20. The system as claimed in claim 19, in which temporarily stored data of the peripheral safety-related unit (9) are read via a bus unit (23) and are monitored and detected by a checking logic (11).

21. (Amended) The system as claimed in claim 19 [or 20], in which a safe state of data transmission, particularly of the output unit (10), is initiated by the checking logic (11).

22. A peripheral safety-related unit in a system for protected data transmission in ring-shaped bus systems, comprising

- two bus units (22, 23), to forward the output data of a bus unit (22) also to the input section of the other bus unit (23) in order to be able to fetch information from the control process via redundant input channels (24, 25) and in order to provide the output data of a peripheral monitoring unit (4) for read-back,
- a buffer (27) in which the output data are stored before their release,

- an output logic (28) via which the temporarily stored data are output, and
- a checking logic (11) which decides whether the data stored in the buffer (27) are output via the output logic (28).

23. The peripheral safety-related unit as claimed in claim 20, characterized in that the checking logic (11) releases or deletes the temporarily stored data.
24. (Amended) The peripheral safety-related unit as claimed in claim[s] 22 [or 23], characterized in that the checking logic (11) receives information from the peripheral monitoring unit (4) in order to be able to prevent a faulty output by this means.